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THE SPECTROSCOPIC BINARY BOSS 1275

BY J. B. CANNON, M.A.

Boss 1275 ($\alpha = 5^h\ 16^m$, $\delta = +29°\ 29'$, spectral type A, mag. 5·7) was discovered to be a spectroscopic binary at Mount Wilson, and the measures of six plates were sent by Dr. Adams to this observatory in October, 1916. Of these, two plates showed the components separated and the other four the spectra were superposed giving one measure.

Forty plates were taken here. The lines appearing were:—

4572·156	(1)	4260·640	(1)
4549·766	(28)	4233·328	(4)
4522·871	(1)	4202·161	(1)
4481·400	(40)	4198·494	(1)
4383·720	(5)	4143·928	(3)
4340·634	(27)	4101·890	(1)
4289·915	(3)	4045·975	(2)
4271·760	(2)	3933·825	(12)

The observations follow:—

OTTAWA OBSERVATIONS OF BOSS 1275

Plate	Julian Day	Phase	V_1	R_1	V_2	R_2	V
7832	2,421,138·79	24·23	+100·1	− 6·0	−139·5	− 7·5	....
7845	140·81	26·23	+ 98·7	−28·3	−118·1	+36·9	....
7853	141·89	27·23	+129·6	+ 5·6	−137·1	+ 4·9	....
7862	143·75	1·75	....	....	....	....	−23·0
7886	167·81	25·83	+128·7	+ 1·7	−129·3	+22·7	....
7893	173·80	4·40	....	....	....	....	−23·2
7918	190·70	21·30	....	....	....	....	+19·8
7960	217·85	20·90	....	....	....	....	−21·5
7969	227·63	3·30	....	....	....	....	−10·8
8009	251·58	0·90	+ 91·7	+ 6·7	−149·4	−37·4	....
8010	251·64	0·96	+ 88·8	+ 6·8	−114·1	− 6·1	....
8016	259·52	7·80	−127·0	−31·0	+ 53·6	−14·4	....
8017	259·58	7·86	−111·1	−14·1	+ 64·7	− 4·3	....
032	262·54	10·80	−114·1	− 9·1	+127·6	+51·1	....
037	266·53	14·80	−100·6	−20·6	+ 66·6	+15·6	....
040	270·67	18·90	....	....	....	....	−27·3

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OTTAWA OBSERVATIONS OF BOSS 1275—*Concluded*

Plate	Julian Day	Phase	V_1	R_1	V_2	R_2	V
8043	2,421,271·51	19·90	....	....	....	....	−26·8
8053	272·74	21·00	....	....	....	....	−31·7
8056	274·66	22·90	....	....	....	....	−47·8
8089	290·52	11·40	−126·5	−23·0	+52·2	−22·8	....
8102	297·51	18·40	....	....	....	....	−10·5
8106	300·51	21·40	....	....	....	....	+11·9
8113	303·61	24·43	+ 45·9	−64·1	−122·7	+13·3	....
8117	307·52	0·90	+ 97·7	+11·7	−108·2	+ 3·8	....
8130	318·53	11·90	− 93·7	+ 7·8	+148·8	+75·0	....
8325	517·88	19·30	....	....	....	....	−27·3
8329	527·92	1·90	+ 70·8	+22·8	− 58·5	+17·5	....
8333	537·91	11·90	−104·7	− 3·0	+ 85·3	+10·8	....
8341	540·90	14·90	− 88·9	−10·9	+ 81·6	+30·6	....
8372	565·69	12·24	−111·8	−11·8	+127·5	+55·3	....
8376	569·74	15·69	....	....	....	....	−47·3
8381	574·69	21·24	+ 75·2	+43·2	− 70·8	−10·8	....
8407	597·65	16·77	....	....	....	....	−49·6
8417	599·68	18·80	....	....	....	....	− 9·5
8433	621·60	13·29	− 64·8	−39·2	+ 79·6	+ 4·3	....
8456	646·59	10·85	−128·3	−23·3	+ 90·3	+14·3	....
8464	656·62	20·88	....	....	....	....	−22·8
8468	663·62	0·45	+121·7	+20·2	....	....	....
8490	688·55	15·38	+111·6	+67·6	−125·5	−52·5	....
8496	693·57	2·97	....	....	....	....	−34·2

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ECOLE POLYTECHNIQUE BIBLIOTHEQUE

MEASURES OF BOSS 1275

λ	7832 p.*		7832 s.*		7845 p.		7845 s.		7853 p.		7853 s.		7862	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4549·766	+ 65·38	¼	−201·20	¼	……	……	……	……	+ 91·50	¼	−177·60	¼	− 25·72	¼
4481·400	+ 72·02	¼	−180·30	¼	+ 52·10	¼	−164·20	¼	+121·60	¼	−157·70	¼	− 73·62	¼
4340·634	+ 79·70	¼	−120·40	¼	+ 90·40	¼	−126·90	¼	+ 94·40	¼	−157·25	¼	……	……
Weighted mean	+ 72·37		−167·30		+ 71·25		−145·55		+102·50		−164·18		− 49·67	
V_a	+ 27·89		+ 27·89		+ 27·58		+ 27·58		+ 27·36		+ 27·36		+ 26·97	
V_d	+ 0·16		+ 0·16		+ 0·14		+ 0·14		± 0·00		± 0·00		+ 0·02	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	+100·1		−139·5		+ 98·7		−118·1		+129·6		−137·1		− 23·0	

*p. = primary
s. = secondary

MEASURES OF BOSS 1275—*Continued*

λ	7886 p.		7886 s.		7893		7918		7960		7969		8009 p.	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4572·156	+110·20	¼	−156·40	¼	....	....	....	....	....	....	....	....	....	....
4549·766	+ 91·20	¼	−132·60	¼	− 46·15	¼	+ 26·88	¼	− 15·11	¼	− 0·92	¼	....	....
4522·871	....	....	....	....	− 34·20	¼	....	....	....	....	....	....	....	....
4481·400	+ 63·60	¼	−191·40	¼	− 41·18	¼	+ 7·38	½	− 9·26	½	+ 4·64	½	+130·00	¼
4340·634	+158·90	¼	−118·60	¼	....	....	+ 11·08	¼	....	....	− 7·00	½	+119·80	¼
4101·890	....	....	....	....	....	....	− 2·03	¼	....	....	....	....	....	....
3933·825	....	....	....	....	....	....	....	....	....	....	− 1·03	¼	+ 86·20	¼
Weighted mean	+108·48		−149·75		− 40·51		+ 10·14		− 16·82		− 1·33		+112·00	
V_a	+ 19·93		+ 19·93		+ 17·55		+ 9·83		− 4·18		− 9·20		− 20·03	
V_d	+ 0·02		+ 0·02		+ 0·01		+ 0·11		− 0·23		+ 0·04		+ 0·04	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	+128·7		−129·3		− 23·2		+ 19·8		− 21·5		− 10·8		+ 91·7	

MEASURES OF BOSS 1275—*Continued*

λ	8009 s.		8010 p.		8010 s.		8016 p.		8016 s.		8017 p.		8017 s.	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4549·766	....	....	+ 76·62	¼	−103·40	¼	−110·40	¼	+ 75·00	¼	....	....	....	....
4481·400	−100·10	¼	+104·10	¼	−113·80	¼	− 90·60	¼	+ 93·70	¼	−117·60	¼	+ 69·10	¼
4340·634	− 70·98	¼	+110·40	¼	−103·30	¼	−109·10	¼	+ 56·78	¼	− 58·10	¼	+106·75	¼
4271·760	....	....	+125·80	¼	−107·70	¼	....	....	....	....	....	....	....	....
4260·640	....	....	+129·20	¼	− 78·18	¼	....	....	....	....	....	....	....	....
4202·161	....	....	+136·20		− 66·04	¼	....	....	....	....	....	....	....	....
4143·928	....	....	....	....	....	....	− 73·90	¼	+ 72·70	¼	....	....	....	....
4045·975	....	....	....	....	....	....	−135·60	¼	+ 85·30	¼	....	....	....	....
3933·825	−111·30	¼	+ 81·80	¼	− 84·00	¼	....	....	....	....	....	....	....	....
Weighted mean	−129·06		+109·16		− 93·77		−103·92		+ 76·70		− 87·85		+ 87·92	
V_a	− 20·03		− 20·03		− 20·03		− 22·91		− 22·91		− 22·91		− 22·91	
V_d	+ 0·04		− 0·07		− 0·07		+ 0·07		+ 0·07		− 0·04		− 0·04	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	−149·4		+ 88·8		−114·1		−127·0		+ 53·6		−111·1		+ 64·7	

MEASURES OF BOSS 1275—*Continued*

λ	8032 p.		8032 s.		8037 p.		8037 s.		8040		8043		8053	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4549·766	− 84·35	¼	+176·10	¼	− 80·10	¼	+ 91·85	¼	+ 21·64	¼	……	……	− 12·46	¼
4481·400	− 94·10	¼	+136·40	¼	− 77·55	¼	+101·10	¼	− 19·52	¼	− 11·26	¼	− 4·68	½
4340·634	− 91·60	¼	+142·80	¼	− 83·00	¼	+ 70·10	¼	− 3·92	¼	− 1·13	¼	− 4·18	¼
4289·915	……	……	……	……	− 63·52	¼	+106·60	¼	……	……	+ 21·20	¼	+ 16·10	¼
4233·328	……	……	……	……	……	……	……	……	……	……	+ 16·01	¼	……	……
4143·928	……	……	……	……	……	……	……	……	……	……	− 24·61	¼	− 16·12	¼
3933·825	……	……	……	……	− 72·60	¼	+ 90·00	¼	……	……	+ 10·61	¼	……	……
Weighted mean	− 90·02		+151·77		− 75·27		+ 91·93		− 0·60		− 0·06		− 4·33	
V_a	− 23·89		− 23·89		− 25·07		− 25·07		− 26·18		− 26·40		− 26·77	
V_d	+ 0·04		+ 0·04		+ 0·04		+ 0·04		− 0·23		− 0·11		− 0·27	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	−114·1		+127·6		−100·6		+ 66·6		− 27·3		− 26·8		− 31·7	

MEASURES OF BOSS 1275—*Continued*

λ	8056		8089 p.		8089 s.		8102		8106		8113 p.		8113 s.	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4549·766	− 39·40	¼	....	....	....	....	+ 47·88	¼	....	....	....	....	− 95·15	¼
4481·400	− 11·31	½	− 93·50	¼	+138·90	¼	+ 25·91	½	+ 64·43	¼	....	....	− 66·80	¼
4383·720	....	....	....	....	....	....	+ 4·48	¼	....	....	....	....	....	....
4340·634	....	....	− 90·98	¼	+ 66·45	¼	+ 5·88	½	+ 15·58	¼	+ 64·16	¼	− 95·92	¼
3933·825	....	....	−105·70	¼	+ 40·68	¼	+ 21·09	¼	+ 46·09	¼	+ 87·98	¼	−112·20	¼
Weighted mean	− 20·34		− 96·73		+ 82·01		+ 19·58		+ 42·03		+ 76·07		− 92·52	
V_a	− 27·11		− 29·44		− 29·44		− 29·75		− 29·75		− 29·66		− 29·66	
V_d	− 0·10		− 0·11		− 0·11		− 0·07		− 0·09		− 0·23		− 0·23	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	− 47·8		−126·5		+ 52·2		− 10·5		+ 11·9		+ 45·9		−122·7	

MEASURES OF BOSS 1275—*Continued*

λ	8117 p.		8117 s.		8130 p.		8130 s.		8325		8329 p.		8329 s.	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4481·400	+135·20	¼	− 76·41	¼	−105·30	¼	+181·40	¼	− 48·58	¼	+ 36·32	½	−146·80	¼
4383·720	......	...	......	...	......	...	......	...	− 55·19	¼	......	...	......	...
4340·634	+107·40	¼	− 49·68	¼	− 42·40	¼	+213·50	¼	......	...	+ 71·03	¼	−114·80	¼
4233·328	+144·80	¼	− 66·32	¼	......	...	......	...	......	...	......	...	......	...
4198·494	......	...	......	...	......	...	......	...	......	...	+ 54·30	¼	......	...
4045·975	+120·60	¼	−108·90	¼	......	...	......	...	......	...	......	...	......	...
3933·825	+130·00	¼	− 90·46	¼	− 47·76	¼	+137·30	¼	......	...	......	...	......	...
Weighted mean	+127·60		− 78·35		− 65·15		+177·40		− 51·88		+ 49·49		− 80·80	
V_a	− 29·44		− 29·44		− 28·09		− 28·09		+ 24·89		+ 21·77		+ 21·77	
V_d	− 0·14		− 0·14		− 0·19		− 0·19		− 0·04		− 0·15		− 0·15	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	+ 97·7		−108·2		− 93·7		+148·8		− 27·3		+ 70·8		− 58·5	

MEASURES OF BOSS 1275—*Continued*

λ	8333 p.		8333 s.		8341 p.		8341 s.		8372 p.		8372 s.		8376	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4549·766	−133·40	¼	+ 61·64	¼	−105·20	¼	+ 49·60	¼	−122·30	¼			− 38·43	¼
4481·400	−143·80	¼	+ 61·71	¼			+ 69·15	½	−121·50	½	+133·80	¼	− 61·32	¼
4383·720									−137·60	¼				
4340·634	− 89·72	¼	+ 80·00	¼			+ 69·21	¼						
4233·328									− 80·75	¼	+111·30	¼		
Weighted mean	−122·31		+ 67·78		−105·20		+ 64·28		−116·73		+122·55		− 49·87	
V_a	+ 18·00		+ 18·00		+ 16·77		+ 16·77		+ 4·95		+ 4·95		+ 2·81	
V_d	− 0·15		− 0·15		− 0·16		− 0·16		+ 0·27		+ 0·27		± 0·00	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	−104·7		+ 85·3		− 88·9		+ 81·6		−111·8		+127·5		− 47·3	

MEASURES OF BOSS 1275—*Continued*

λ	8381 p.		8381 s.		8407		8417		8433 p.		8433 s.		8456 p.	
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4549·766	+ 62·56	¼	− 97·38	¼	− 49·30	½	+ 0·65	½	....		....		−110·80	¼
4481·400	+ 97·24	¼	− 82·21	¼	− 14·65	¼	+ 3·38	½	− 42·70	¼	+101·70	¼	−119·80	¼
4383·720	....		....		....		− 13·32	¼	....		....		− 67·90	¼
4340·634	....		− 43·00	½	....		+ 25·79	¼	....		....		....	
4233·328	+ 79·64	¼	− 88·80	¼	....		....		....		....		....	
3933·825	+ 61·42	¼	....		....		....		....		....		....	
Weighted mean	+ 75·21		− 70·88		− 37·75		+ 3·42		− 42·70		+101·70		− 99·50	
V_a	+ 0·22		+ 0·22		− 11·55		− 12·53		− 21·81		− 21·81		− 28·36	
V_d	+ 0·04		+ 0·04		− 0·01		− 0·07		− 0·04		− 0·04		− 0·14	
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28	
Radial Velocity	+ 75·2		− 70·8		− 49·6		− 9·5		− 64·8		+ 79·6		−128·3	

MEASURES OF BOSS 1275—*Concluded*

λ	8456 s.		8464		8468 p.		8490 p.		8490 s.		8496			
	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.	Vel.	Wt.
4549·766	+149·10	¼	− 16·53	¼	+157·30	¼	+151·70	¼	− 77·90	¼	....	.	. . .	.
4481·400	+102·40	¼	+ 22·02	¼	+146·70	¼	+126·90	¼	−117·81	¼	− 7·61	¼		
4340·634	....	....	+ 16·18	¼	....	....	....	....	....	....	....		. .	
4271·760	+122·60	¼	....	....	....	....	....	....	....	.	. .	.	. . . .	.
Weighted mean	+119·12		+ 7·22		+152·00		+139·30		− 97·85		− 7·61		....	..
V_a	− 28·36		− 29·50		− 29·76		− 27·19		− 27·19		− 26·05		.....	
V_d	− 0·14		− 0·22		− 0·23		− 0·22		− 0·22		− 0·28		.....	.
Curv.	− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		− 0·28		.....	.
Radial Velocity	+ 90·3		− 22·8		+121·7		+111·6		−125·5		− 34·2		....	.

The forty plates were grouped so that, including the common points where the spectra were superposed, there were eight normal places for each curve. At first each component was treated separately. Preliminary elements were chosen for each and a least-squares solution carried through in each case. The resulting elements were as follows:—

$P = 27{\cdot}43$ days
$e_1 = {\cdot}334$
$e_2 = {\cdot}173$
$\omega_1 = 36^\circ{\cdot}62$
$\omega_2 = 219^\circ{\cdot}45$
$\gamma_1 = -27{\cdot}03$ km.
$\gamma_2 = -2{\cdot}01$ km.
$T_1 = 2{,}421{,}142{\cdot}5$ J.D.
$T_2 = 2{,}421{,}142{\cdot}7$ J.D.
$K_1 = 122{\cdot}4$ km.
$K_2 = 117{\cdot}6$ km.

It will be seen that the greatest differences occur in the values of e and γ, and that any mean value chosen for both will necessarily greatly increase the residuals in the two cases.

The residuals from the separate treatment are given below, and can be compared with those from the elements obtained by combining the two.

Number	R_1	R_2
1	+ 8·0	− 0·9
2	− 7·9	+ 3·1
3	+ 8·2	− 10·4
4	− 4·0	+ 7·1
5	+ 1·9	− 13·7
6	− 2·2	+ 8·0
7	+ 6·9	+ 2·1
8	− 2·4	+ 0·2

The two sets of elements were then combined and the mean values of e, ω, γ, and T taken as preliminary values for the two curves, the values of K_1 and K_2 being accepted as preliminary values for them. Two least-squares solutions were found to be necessary in order to obtain the closest approximation. These resulted as follows:—

$P = 27{\cdot}43$ days
$\gamma = -14{\cdot}17$ km.
$K_1 = 116{\cdot}91$ km.
$K_2 = 116{\cdot}12$ km.
$e = {\cdot}247$

$$\begin{aligned} \omega_1 &= 29^\circ\cdot 80 \\ \omega_2 &= 209^\circ\cdot 80 \\ T &= 2{,}421{,}142\cdot 00 \text{ J.D.} \\ a_1 \sin i &= 42{,}730{,}000 \text{ km.} \\ a_2 \sin i &= 42{,}440{,}000 \text{ km.} \\ \frac{m_1 \sin^3 i}{(m_1 + m)^2} &= 4\cdot 0 \odot \end{aligned}$$

The normal places and their residuals are now:—

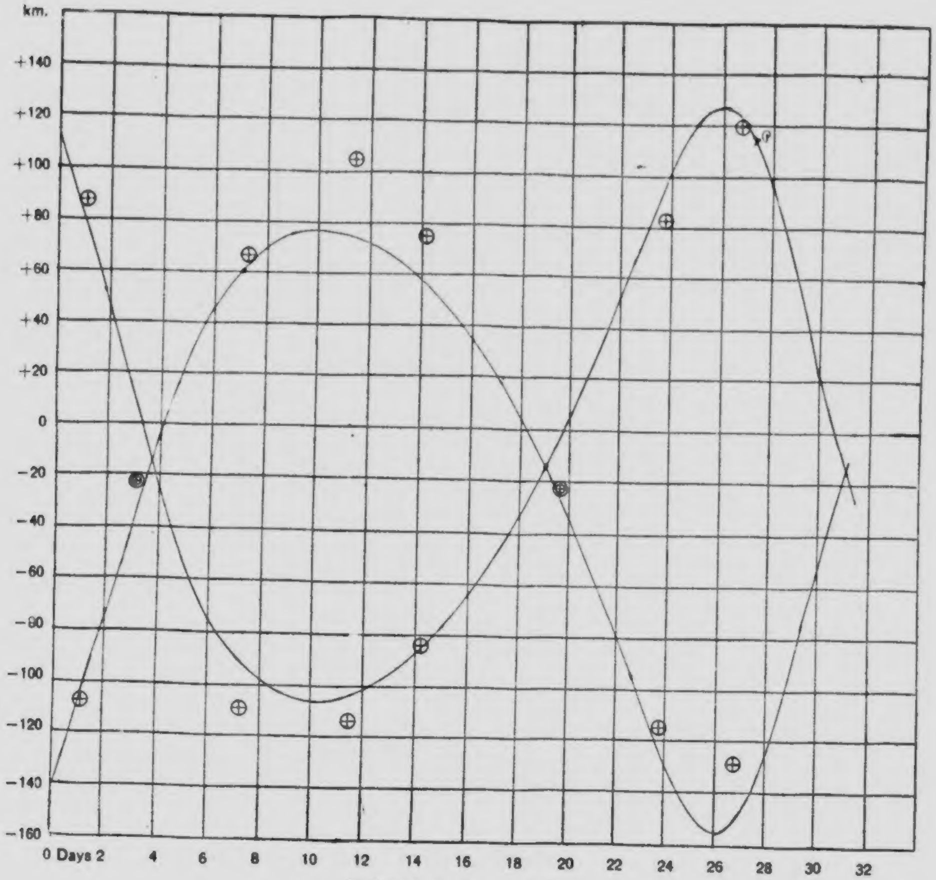
Number	Phase	V_1	R_1	V_2	R_2
1	23·76	+ 83·2	− 11·9	− 114·6	+ 8·1
2	26·76	+ 119·7	− 4·1	− 128·2	+ 23·0
3	1·06	+ 87·2	+ 6·6	− 107·5	+ 0·8
4	3·06	− 22·8	− 26·9	− 22·8	+ 9·6
5	7·26	− 109·0	− 17·0	+ 66·6	+ 3·5
6	11·46	− 113·2	− 9·4	+ 105·3	+ 30·4
7	14·26	− 84·8	+ 0·8	+ 75·9	+ 19·1
8	19·66	− 22·3	− 18·3	− 22·3	+ 2·0

These residuals are much larger than those obtained from treating the components separately. However, it is not at all probable that the stars are separate systems, but are two stars of the same system and must therefore have a common γ, e, ω and T. The lines measured are in nearly all plates poorly defined and few in number, and it is possible that a larger number of plates might have been more satisfactory.

The Mount Wilson plates from which the binary character of the star was discovered, do not give velocities which fit the curve well. However, the observations obtained here indicate that this period—27·43 days—is the correct one, and the elements found are probably a fairly close approximation to the true ones.

On the curve, the double circles are those normal places common to the two components. The values of K_1 and K_2 are practically the same, and the stars are hence about equal in mass. The lines where separated also show that there is little difference in brightness.

Dominion Observatory
Ottawa
August, 1918.



Radial Velocity Curve of Boss 1275

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